for oil-fired commercial warm air furnaces. In addition to the flue temperature measurement specified in section 40.6.8 of UL 727–2006, (incorporated by reference, see § 431.75) you must locate one or two sampling tubes within six inches downstream from the flue temperature probe (as indicated on Figure 40.3 of UL 727–2006). If you use an open end tube, it must project into the flue one-third of the chimney connector diameter. If you use other methods of sampling CO_2, you must place the sampling tube so as to obtain an average sample. There must be no air leak between the temperature probe and the sampling tube location. You must collect the flue gas sample at the same time the flue gas temperature is recorded. The CO_2 concentration of the flue gas must be as specified by the manufacturer for the product being tested, with a tolerance of ±0.1 percent. You must determine the flue CO_2 using an instrument with a reading error no greater than ±0.1 percent.

(2) *Procedure for the measurement of condensate for a gas-fired condensing commercial warm air furnace.* The test procedure for the measurement of the condensate from the flue gas under steady state operation must be conducted as specified in sections 7.2.2.4, 7.8, and 9.2 of ASHRAE Standard 103–1993 (incorporated by reference, see § 431.75) under the maximum rated input conditions. You must conduct this condensate measurement for an additional 30 minutes of steady state operation after completion of the steady state thermal efficiency test specified in paragraph (b) of this section.

(d) *Calculation of thermal efficiency*—(1) *Gas-fired commercial warm air furnaces.* You must use the calculation procedure specified in section 2.39, Thermal Efficiency, of ANSI Z21.47–2006 (incorporated by reference, see § 431.75). (Note, this is section 2.38 in ANSI Z21.47–1998 (incorporated by reference, see § 431.75))

(2) *Oil-fired commercial warm air furnaces.* You must calculate the percent flue loss (in percent of heat input rate) by following the procedure specified in sections 11.1.4, 11.1.5, and 11.1.6.2 of the HI BTS–2000 (incorporated by reference, see § 431.75). The thermal efficiency must be calculated as:

Thermal Efficiency (percent) = 100 percent − flue loss (in percent).

(e) *Procedure for the calculation of the additional heat gain and heat loss, and adjustment to the thermal efficiency, for a condensing commercial warm air furnace.* (1) You must calculate the latent heat gain from the condensation of the water vapor in the flue gas, and calculate heat loss due to the flue condensate down the drain, as specified in sections 11.3.7.1 and 11.3.7.2 of ASHRAE Standard 103–1993, (incorporated by reference, see § 431.75), with the exception that in the equation for the heat loss due to hot condensate flowing down the drain in section 11.3.7.2, the assumed indoor temperature of 70 °F and the temperature term T_{OA} must be replaced by the measured room temperature as specified in section 2.2.8 of ANSI Z21.47–2006 (incorporated by reference, see § 431.75).

(2) *Adjustment to the Thermal Efficiency for Condensing Furnace.* You must adjust the thermal efficiency as calculated in paragraph (d)(1) of this section by adding the latent gain, expressed in percent, from the condensation of the water vapor in the flue gas, and subtracting the heat loss (due to the flue condensate down the drain), also expressed in percent, both as calculated in paragraph (e)(1) of this section, to obtain the thermal efficiency of a condensing furnace.

[77 FR 28987, May 16, 2012]

ENERGY CONSERVATION STANDARDS

§ 431.77 Energy conservation standards and their effective dates.

Each commercial warm air furnace manufactured on or after January 1, 1994, must meet the following energy efficiency standard levels:

(a) For a gas-fired commercial warm air furnace with capacity of 225,000 Btu per hour or more, the thermal efficiency at the maximum rated capacity (rated maximum input) must be not less than 80 percent.

(b) For an oil-fired commercial warm air furnace with capacity of 225,000 Btu per hour or more, the thermal efficiency at the maximum rated capacity

(rated maximum input) must be not less than 81 percent.

Subpart E—Commercial Packaged Boilers

SOURCE: 69 FR 61960, Oct. 21, 2004, unless otherwise noted.

§ 431.81 Purpose and scope.

This subpart contains energy conservation requirements for certain commercial packaged boilers, pursuant to Part C of Title III of the Energy Policy and Conservation Act. (42 U.S.C. 6311–6317)

[69 FR 61960, Oct. 21, 2004, as amended at 70 FR 60415, Oct. 18, 2005]

§ 431.82 Definitions concerning commercial packaged boilers.

The following definitions apply for purposes of this subpart E, and of subparts A and J through M of this part. Any words or terms not defined in this section or elsewhere in this part shall be defined as provided in 42 U.S.C. 6311.

Basic model means all commercial packaged boilers manufactured by one manufacturer within a single equipment class having the same primary energy source (e.g., gas or oil) and that have essentially identical electrical, physical and functional characteristics that affect energy efficiency.

Btu/h or *Btu/hr* means British thermal units per hour.

Combustion efficiency for a commercial packaged boiler is determined using test procedures prescribed under § 431.86 and is equal to 100 percent minus percent flue loss (percent flue loss is based on input fuel energy).

Commercial packaged boiler means a type of packaged low pressure boiler that is industrial equipment with a capacity, (rated maximum input) of 300,000 Btu per hour (Btu/hr) or more which, to any significant extent, is distributed in commerce:

(1) For heating or space conditioning applications in buildings; or

(2) For service water heating in buildings but does not meet the definition of ''hot water supply boiler'' in this part.

Condensing boiler means a commercial packaged boiler that condenses part of the water vapor in the flue gases, and that includes a means of collecting and draining this condensate from its heat exchanger section.

Flue condensate means liquid formed by the condensation of moisture in the flue gases.

Manufacturer of a commercial packaged boiler means any person who manufactures, produces, assembles or imports such a boiler, including any person who:

(1) Manufactures, produces, assembles or imports a commercial packaged boiler in its entirety;

(2) Manufactures, produces, assembles or imports a commercial packaged boiler in part, and specifies or approves the boiler's components, including burners or other components produced by others, as for example by specifying such components in a catalogue by make and model number or parts number; or

(3) Is any vendor or installer who sells a commercial packaged boiler that consists of a combination of components that is not specified or approved by a person described in paragraph (1) or (2) of this definition.

Packaged boiler means a boiler that is shipped complete with heating equipment, mechanical draft equipment and automatic controls; usually shipped in one or more sections and does not include a boiler that is custom designed and field constructed. If the boiler is shipped in more than one section, the sections may be produced by more than one manufacturer, and may be originated or shipped at different times and from more than one location.

Packaged high pressure boiler means a packaged boiler that is:

(1) A steam boiler designed to operate at a steam pressure higher than 15 psi gauge (psig); or

(2) A hot water boiler designed to operate at a water pressure above 160 psig or at a water temperature exceeding 250 °F, or both; or

(3) A boiler that is designed to be capable of supplying either steam or hot water, and designed to operate under the conditions in paragraphs (1) and (2) of this definition.

Packaged low pressure boiler means a packaged boiler that is: